

A REVISION OF THE BRYOZOAN GENUS *CORBULIPORA* MACGILLIVRAY

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ABSTRACT: Restudy of specimens of the bryozoan genus *Corbulipora* shows that the genus is divisible into two subgenera, *Corbulipora* (*Corbulipora*) and *Corbulipora* (*Anaskopora*) based on development of the frontal wall. The species *C. ornata*, *C. cornuta*, *C. pennata*, *C. oriparma* sp. nov., *C. collaris* and some specimens of *C. ampulla* are referred to *Corbulipora* (*Corbulipora*) and *C. elevata* and some specimens of *C. ampulla* are referred to *Corbulipora* (*Anaskopora*). The stratigraphic range of the genus in Tertiary strata of southern Australia is examined.

INTRODUCTION

The bryozoan genus *Corbulipora* was erected by MacGillivray (1895) with *C. ornata*, the only species described. Maplestone (1901) described *C. ampulla*, also from the Tertiary of Victoria. Canu & Bassler (1920) described *C. collaris* from the Tertiary of U.S.A. and in 1958, Brown described a new species, *C. pennata*, from the Tertiary of south-western Victoria and also re-assigned *Cribrilina cornuta* Macgillivray and *Cribrilina elevata* MacGillivray to *Corbulipora*.

In a previous study (Wass 1973) a cursory examination of type specimens had shown that the frontal wall appeared to be of two distinct types. One group typified by *Corbulipora ornata* showed a distinctly regular arrangement of costae comprising the frontal wall, whereas the second group, characterized by *C. elevata*, showed the frontal wall calcified with irregularly spaced lacunae; the only regular arrangement was costae arising from the gymnocyst and essentially supporting the frontal wall. Examination of additional material has established these two groups as distinct entities and for this reason, *Corbulipora* is divided into two subgenera, *Corbulipora* (*Corbulipora*) and *Corbulipora* (*Anaskopora*) subgen. nov. Wass (1973) described calcification in Recent specimens of *Corbulipora* from the southern Australian continental shelf. Specimens used in that study form the basis of a new species, *Corbulipora* (*Corbulipora*) *oriparma* sp. nov. from the following localities of Wass et al. (1970): 90K, 35°03'S, 134°11'E, 109 fathoms; 123K,

38°15'S, 140°29'E, 85-120 fathoms; 180K, 40°48'S, 148°43'E, 65 fathoms.

Terminology follows that of Larwood (1962) except that upgrowths from lumen pores, pelma or pelmatidia, are termed secondary spines. Observations are based on the distribution of calcification.

The following is a list of localities from which the genus has been mentioned previously in bryozoan literature from southern Australia. References are to the source of information, additional information or a map of the locality. Tertiary series names have been supplied by D. J. Taylor (pers. comm.).

Balcombe Bay: This locality is probably Fossil Beach at the northern end of Balcombe Bay, Port Phillip, south-east of Melbourne; basal Mid-Miocene, Balcombe Clay. (Gostin 1966).

Bird Rock: This is a rock in Half Moon Bay, south of Torquay, 80 kilometres south-west of Melbourne; Early Miocene, Torquay Group. (Singleton 1941, Fig. 8). It is not the locality of the same name at the northern entrance to Corio Bay.

Corio Bay: This locality is probably on Western Beach, north of Geelong; Late Miocene, Fyansford Clay. (Bowler 1963, Spencer-Jones 1970).

Gellibrand: The exact locality is uncertain as there are numerous fossiliferous localities in the region.

Mitchell River, Bairnsdale: The locality could be one of many, and therefore the stratigraphic horizon and age may vary. Rocks in the area

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range from basal Mid-Miocene to Late Miocene (Carter 1964, Fig. 5).

Mornington: This locality is probably the same as Schnapper Point.

Muddy Creek: This probably refers to MacDonaldis Bank, Muddy Creek, west of Hamilton, Victoria; basal Mid-Miocene, Muddy Creek Marl. (Spencer-Jones 1971, p. 247, Fig. 12-1).

Schnapper Point: This is a headland on Port Phillip Bay at Mornington, 40 kilometres south-east of Melbourne; basal Mid-Miocene, Balcombe Clay. (Gostin 1966).

Localities referred to Brown (1958) have been updated stratigraphically by Cockbain (1971) and this information is used through the text.

Abbreviations used throughout the text are listed below:

NMV National Museum of Victoria, Melbourne.

SUP Sydney University Palaeontological Collection, Sydney.

MGSV Museum of the Geological Survey of Victoria, Melbourne.

USNM United States National Museum, Smithsonian Institution, Washington, D.C.

BM British Museum (Natural History), London.

No measurements of zoecia are included in the systematic section as zoecial boundaries are rather arbitrarily defined in *Corbulipora*.

SYSTEMATIC PALAEOLOGY

Genus *Corbulipora* MacGillivray 1895

TYPE SPECIES: (by monotypy) *Corbulipora ornata* MacGillivray, 1895, p. 60, Pl. 8, figs. 20, 21 from Schnapper Point and Muddy Creek, Victoria.

DIAGNOSIS: Zoaria bilamellar or encrusting, sometimes quadrilateral; zoecia rectangular to oval in outline; frontal wall developed from vertical or near vertical costae which rise from the gymnocyst and bifurcate or bend to form a regular or irregular arrangement of costae and lacunae; orifice semi-circular, oral spines and avicularia may be present; ovicell entozooidal.

Subgenus *Corbulipora* subgen. nov.

TYPE SPECIES: as for the genus.

DIAGNOSIS: as for the genus, but the frontal wall is composed of costae with a regular, sometimes radiating pattern.

REMARKS: Species previously referred to *Corbulipora* and included in the subgenus are *C. ornata*, *C. collaris*, *C. cornuta*, *C. pennata* and some specimens referred to *C. ampulla*.

Corbulipora (Corbulipora) is known from the Tertiary and Recent of Australia and North America. It has been found living only on the southern Australian continental shelf.

Corbulipora (Corbulipora) ornata MacGillivray (Pl. 7, figs. 1-2)

LECTOTYPE (here chosen): NMV 27642 from Schnapper Point. (MacGillivray, 1895, Pl. 8, fig. 20). OTHER SPECIMENS: NMV 28041 from Schnapper Point, NMV 28043, 28040, 27643 (MacGillivray, 1895, Pl. 8, fig. 21) from Muddy Creek, NMV 28039 from Bird Rock, USNM 85636 from the Mitchell River, Bairnsdale, USNM 60171 from Muddy Creek, BM D34219 from the Gellibrand River. Specimens are recorded by Brown (1958) from Localities XVI, XXII, XXIII, and XXVI.

DIAGNOSIS: *Corbulipora* with zoecia arranged quadrilaterally; frontal wall composed of 16 to 22 costae, regularly arranged; a strongly developed apertural bar and elongate region of smooth, proximal gymnocyst present; avicularia lacking.

DESCRIPTION: Zoecia are elongate and arranged quadrilaterally around the zoarium. Both lateral and proximal gymnocyst are finely granulated; they appear smooth under normal optical conditions. Zoecia are characterized by a marked development of the proximal gymnocyst which may be more than one-third the length of frontal shield. The frontal wall is composed of from 16 to 22 costae which rise vertically or nearly vertically from the gymnocyst and bend towards the central region before forming pematidia and subsequently secondary spines. Costae are generally normal to the growth direction, and finely granulated but appear smooth under normal optical conditions. Lacunae are absent on most specimens which also show complete calcification between uprising costae. The two most distal costae form a strong apertural bar which in lateral view projects distally and vertically. The orifice is semicircular with the distal margin rounded. Two oral spines are present, both being distolateral to the orifice. Ovicells and avicularia have not been observed.

REMARKS: This species shows some similarity to *C. (Corbulipora) collaris* but can be readily distinguished because of the fewer costae in the frontal wall. The presence of an elongate area of proximal gymnocyst is sufficient to separate it from all species.

Corbulipora (Corbulipora) cornuta (MacGillivray) (Pl. 7, figs. 3-6, Pl. 8, fig. 3)

LECTOTYPE (here chosen): NMV 27635 from Schnapper Point (MacGillivray, 1895, Pl. 8, fig. 11). OTHER SPECIMENS: NMV 28047, 28149, 28045 from Schnapper Point; NMV 27636 (MacGillivray, 1895, Pl. 8, fig. 12) from Muddy Creek; NMV 28044 from Gellibrand; NMV 28150 from Corio Bay; NMV 28046, 27634 (MacGillivray, 1895, Pl. 8, fig. 10) from unknown localities; BM D35474 from Muddy Creek, BM D34233 from Balcombe Bay, MGSV 53106 from the Myaring Beds (Cockbain, 1971) at Locality XI of Brown (1958, p. 13). Brown also records specimens from Locality XVI.

DIAGNOSIS: Zoaria tending to be elongate cylindrical or spherical in form; frontal wall composed of 20 to 24 costae in a regular, radiating pattern; two oral spines distal to orifice; distal adventitious avicularia pointing distally or laterally.

DESCRIPTION: Zoaria are elongate cylindrical or spherical in form; zooecia tend to be oval, elongate disto-proximally, in outline. Zooecia are generally arranged irregularly and closely packed so the terms proximal and distal refer only to the growth direction of a single zooecium. The irregular arrangement and close packing of zooecia results in a variable area of lateral and proximal gymnocyst. It has a gnarled appearance. From 20 to 24 smooth and/or granulated costae arise from the gymnocyst. Just above the level of gymnocyst, they change attitude and rise gradually to the central region of the frontal shield. Lateral costal fusions and lacunae are evident throughout their length. No secondary spines are present.

The orifice is slightly constricted proximally and some specimens possess condyles which divide the orifice into a one-third poster, two-thirds anter. One oral spine is strongly developed on each distolateral side of the orifice. In some zooecia there are minor granulations around the distal rim of the orifice and these may indicate development of additional oral spines. Ovicells have not been observed. Adventitious avicularia are present, in most cases, distal to the orifice. They point distally, if space is available for their development; if not available, they may point laterally but no avicularia have been observed pointing proximally. Both proximal and distal ends are rounded and lateral constrictions are centrally placed.

REMARKS: The regular, radial arrangement of costae in the frontal wall associated with the distal avicularia are features sufficient to differentiate this species from all others. MGSV 53107 from Locality XXV of Brown (1958) shows some similarity to this species but whereas in *C. (C.) cornuta* there may be up to 9 lateral costal fusions per costal length, in this specimen the number is reduced to two.

***Corbulipora (Corbulipora) oriparma* sp. nov.**
(Pl. 9, figs. 1-7), Pl. 10, figs. 1-6, 9-11)

HOLOTYPE: SUP 14409 from Locality 180K of Wass et al. (1970).

PARATYPES: SUP 14403-14407 from 90K; SUP 14408, 14410 from 180K; SUP 14411-14412 from 123K of Wass et al. (1970).

DIAGNOSIS: Bilamellar, encrusting *Corbulipora* with proximal zooecia elongate and narrow, zooecia of the central region shorter and wider and those of the distal region oval and rounded; the oral spines, one distal and two distolateral, arch proximally over the orifice to form an oral shield.

DESCRIPTION: Zoaria are bilamellar or encrusting; proximal zooecia are elongate and narrow in shape and their frontal wall is composed of from 14 to 20 costae; distal zooecia have from 12 to 15 radiating costae comprising the frontal wall of their rounded or oval zooecia; zooecia in the central region of the colony are shorter and wider than those in the proximal region and their frontal wall has from 13 to 16 costae. Except in distal zooecia, most costae are normal to the growth direction. The lateral and

proximal gymnocyst is smooth and of reduced area. Costae arise vertically from the gymnocyst at a level below the frontal membrane. Once above this level they bifurcate; one costa travels in a horizontal plane above the membrane whereas the other travels vertically to form the equivalent of a secondary spine. These also form from pelma and pematidia along the length of costae and have an unusual structure in that they are composed of a central tube surrounded by a series of rounded, hollow depressions. The spines may fuse with other spines from the same or adjacent zooecia. Lacunae and lateral costal fusions are present throughout the costal length.

The orifice is semicircular with a rounded distal margin at a lower level than the straight proximal margin. The operculum is hinged proximally. Three oral spines are present, one being placed at the distal margin of the orifice and the other two on the distolateral margins. The latter develop before the distal spine but all three may bifurcate and eventually project proximally and coalesce to form an oral shield. This completely covers the orifice. Oral spines may project proximally as far as the third costa.

Ovicells and avicularia have not been observed. As mentioned previously, the zooecial shape changes throughout the zoarium. An ontogenetic state can develop in which the oral shield has developed in astogenetically later zooecia at the growing edge before its development is complete in older zooecia. Communication between adjacent zooecia is by means of a pore-plate; the distal regions of the colony have communication by means of a structure which has 3 levels. At the lower level is a plate with multiporous septulae; the outer margins of this plate grow upwards and distally and an opening forms at a higher level and then from the margins of this opening additional calcification produces an even larger opening. It is from this structure which is placed distally or disto-laterally that budding of subsequent zooecia ensues.

Only one specimen exhibited an ancestrula. Its frontal wall is composed of 14 costae which rise from the gymnocyst, and bifurcate with one branch projecting radially and horizontally into a central region. An orifice cannot be seen.

In some zoaria, long rootlets are evident at the growing edge. They appear to develop from budding structures.

REMARKS: The change in zooecial shape from the proximal to distal regions and the presence of the oral shield and secondary spines give this species such a bizarre appearance that it is easily separated from all others.

***Corbulipora (Corbulipora) pennata* Brown**
(Pl. 10, figs. 7-8)

HOLOTYPE: MGSV 53025 from the Early Miocene Sandford Limestone at Locality XXIII (Brown, 1958, pp. 13, 55, fig. 33).

OTHER SPECIMENS: As far as I am aware, no other specimens of the species exist.

DIAGNOSIS: See Brown (1958, p. 55).

REMARKS: The frontal wall is composed of 16 radiating costae which rise vertically from a smooth lateral and proximal gymnocyst. They bifurcate and the costae so formed grow in both vertical and horizontal planes. In a horizontal plane, costae projecting across the frontal membrane are by far the stronger; costae growing upwards over the gymnocyst project beyond the basal margin of the zoecium; vertical growth at the point of bifurcation produces a secondary spine in some cases.

Brown (1958) states 'this bizarre form is of the *Corbulipora elevata* type'. In my opinion, the two species are quite distinct and *C. (Corbulipora) pennata* shows more resemblance to *C. (Corbulipora) cornuta* in the appearance of the frontal wall composed of radiating costae. However, the lack of lateral costal fusions and the structure of the apertural bar in *pennata* enable the two species to be readily distinguished.

Corbulipora (Corbulipora) collaris Canu & Bassler

(Pl. 8, figs. 7-9)

HOLOTYPE: USNM 64035 from the Middle Jacksonian (Late Eocene), Castle Hayne Limestone, Wilmington, North Carolina, U.S.A. (Canu & Bassler, 1920, p. 309, Pl. 43, fig. 14).

OTHER SPECIMENS: USNM 189309 (labelled *Corbulipora* by Bassler).

DIAGNOSIS: Zoaria may be quadriserial; zoecia elongate with frontal wall composed of 24 to 32 costae, most of which are regularly arranged and oriented normal to growth direction; costae possess lumen pores, lacunae present; avicularia present, pointing laterally; apertural bar strongly developed.

REMARKS: Preservation of specimens is not good and it is difficult to understand how Canu & Bassler observed so much from USNM 64035. The additional specimen, USNM 189309, exhibits a swelling remarkably similar to an entozooidal ovicell. There appears to be some development of laterally placed oral spines in some zoecia.

The arrangement of costae shows some resemblance to *C. (Corbulipora) ornata*; differences between the two species have been discussed previously.

Corbulipora (Anaskopora) subgen. nov.

TYPE SPECIES: *Corbulipora elevata* (MacGillivray), 1895, p. 59, Pl. 8, figs. 19, 19a from Schnapper Point.

DIAGNOSIS: As for the genus, except that the frontal wall does not possess a regular pattern of costae.

REMARKS: *Corbulipora (Anaskopora)* is known only from Tertiary strata in Victoria. As well as the type species, some specimens of *C. ampulla* can be referred to the subgenus.

Corbulipora (Anaskopora) elevata (MacGillivray)

(Pl. 8, figs. 1, 2, 4)

LECTOTYPE (here chosen): NMV 27641 from Schnapper Point. (MacGillivray, 1895, Pl. 8, fig. 19).

OTHER SPECIMENS: NMV 28038 from Corio Bay; BMD 34738 from Muddy Creek; BMD 35452 from Balcombe Bay; USNM 85692 from Mount Gambier:

specimens are recorded by Brown (1958) from Localities XI and XIV.

DIAGNOSIS: Zoaria sub-spherical; zoecia with 8 to 10 costae; bifurcating costae produce a frontal wall devoid of regular arrangement; two oral spines, lateral to orifice; avicularia adventitious or inter-zoecial, generally distal to orifice, pointing distally or laterally.

DESCRIPTION: Zoaria are spherical; autozooids are oval in outline, possessing both lateral and proximal gymnocyst with the latter being the better developed. The gymnocyst has a gnarled appearance. From 8 to 10 costae arise from the gymnocyst and spread inwards. They bifurcate, and subsequent bifurcations enable a frontal wall to be formed which is devoid of a regular, radial arrangement. The frontal wall may be at the same level as the costae or slightly depressed below this level. No secondary spines arise from the bifurcating costae. Lacunae are from 9 to 12 in number, lacking regular orientation.

The orifice tends to be oval laterally possessing a broad sinus, approximately one-third the orifice width, and possibly two condyle-like structures. Two strongly developed oral spines are present, one on each side of the orifice. In some zoecia there may be other spinose structures on the distal margin of the orifice.

Ovicells have not been observed. Avicularia are common. They tend to be adventitious or inter-zoecial and are placed distal to the orifice. They generally point distally but this may become laterally depending on space for their development. The distal end is distinctly rounded and lateral constrictions are present near the proximal one-third of the avicularium.

Although not observed, the orientation of the zoecia suggests that budding takes place through distal and distolateral pore chambers.

REMARKS: Within the subgenus and *Corbulipora (Corbulipora)*, the small number of costae arising from the gymnocyst enables this species to be differentiated from all others.

Corbulipora (Anaskopora) ampulla Maplestone

(Pl. 8, figs. 5-6)

LECTOTYPE (here chosen): NMV P10156 from Mornington (Maplestone, 1901, Pl. 34, fig. 9).

OTHER SPECIMENS: BM D34736 from Muddy Creek.

DIAGNOSIS: Zoecia oval, with more than 20 costae arising from the gymnocyst; orifice with strongly developed bar; frontal wall composed of calcification with irregularly spaced lacunae.

DESCRIPTION: Zoaria appear to be encrusting; zoecia are oval in outline with a smooth, narrow gymnocyst. Smooth costae, generally more than 20 arise vertically or nearly vertically from the gymnocyst. They bifurcate and proceed in a nearly horizontal plane to form the frontal wall with no regular arrangement of costae; the frontal wall is pierced by irregularly placed lacunae. Strong development of the two most distal costae results in the formation of an apertural bar which is elongated distally to form a hood over the orifice.

| SPECIES | OLIGOCENE | EARLY MIOCENE | MIDDLE MIOCENE | LATE MIOCENE |
|--------------------|-----------|---------------|----------------|--------------|
| <i>ornata</i> | ————— | | | |
| <i>cornuta</i> | ————— | | | |
| <i>pennata</i> | | ————— | | |
| <i>elevata</i> | | ————— | | |
| <i>ampulla</i> | | | ————— | |
| cf. <i>ampulla</i> | | ————— | | |

FIG. 1.—Stratigraphic ranges of species of *Corbulipora* in Tertiary strata of Australia.

REMARKS: Brown (1958) referred specimens from his Locality XIV to *Corbulipora* sp. aff. *C. ampulla*. To my knowledge these specimens were not catalogued. Brown also referred BM D34752 to this species.

This specimen BM D34752 consists of a zoarium in which one zoecium is broken around the lateral and proximal gymnocyst in a plane parallel to the frontal membrane. The frontal wall shows an arrangement similar to that of *Corbulipora* (*Anaskopora*) but on viewing the undersurface of the frontal wall a definite radiating pattern of costae and interspersed lacunae can be observed. One wonders therefore if it is not an abundance of calcification which destroys the regular radiating arrangement of costae in species which possess numerous lacunae in the frontal wall. *Corbulipora* (*A.*) *ampulla* would be typical of these species. The problem would not be so great with species whose frontal wall possesses few lacunae, e.g. *Corbulipora* (*A.*) *elevata*.

STRATIGRAPHIC DISTRIBUTION

Bryozoa are very plentiful in the Tertiary strata of southern Australia. In this study, all known specimens of *Corbulipora* in Museum collections have been examined. Many of them do not possess locality information but for those specimens that do, except for *Corbulipora* (*Corbulipora*) *oriparma*, their distribution is shown in Fig. 1. *Corbulipora* (*Corbulipora*) *collaris* from U.S.A. is not included.

The bryozoan distribution is such that Bryozoa may be used, along with other phyla, in the stratigraphic assignation of beds. In postulating a phylogenetic development, I would suspect that *C. (C.) ornata* would be the original species, giving rise to *C. (C.) cornuta* with its oval outline and regular, radiating costae. This, in turn, would give rise to *C. (A.) elevata* with an oval outline but the regular, radiating costal pattern has been replaced by an irregular arrangement of lucunae in calcification formed from radiating costae.

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during tenure of the Eleanor Sophia Wood Traveling Fellowship in 1970, when I was at the British Museum (Natural History) on study leave from the University of Sydney. Miss P. L. Cook supervised my introduction to cheilostome Bryozoa and, along with Mr. R. F. Wise, made specimens available from the British Museum (Natural History). Other specimens were made available from the U.S. National Museum by Dr. A. H. Cheetham, from the National Museum of Victoria by Mr. T. Darragh and from the Museum of the Geological Survey of Victoria by Dr. C. Abele. Professor G. M. Philip and Mr. D. J. Taylor assisted in elucidating the Tertiary stratigraphy of Southern Australia. Recently, the study has been supported by ARGC. Grant D72/15169 and the University of Sydney Research Grant. For all this assistance, I am grateful.

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EXPLANATION OF PLATES 7-10

All photos were taken on a scanning electron microscope; Pl. 9, fig. 1 was taken at the British Museum (Natural History); all other photos were taken by the Electron Microscope Unit, University of Sydney.

PLATE 7

- FIG. 1—*Corbulipora (Corbulipora) ornata* MacGillivray, NMV 27642, view of zoarium; $\times 45$.
 FIG. 2—*Corbulipora (Corbulipora) ornata* NMV 27643, view of frontal wall showing apertural bar; $\times 90$.
 FIG. 3—*Corbulipora (Corbulipora) cornuta* (MacGillivray), NMV 27635, frontal view of zoecium; $\times 55$.
 FIG. 4—As above, lateral view of zoecium to show relation of costae to lateral gymnocyst; $\times 55$.
 FIG. 5—As above, frontal view of zoecium to show relation of orifice and distal avicularium; $\times 75$.
 FIG. 6—*Corbulipora (Corbulipora) cornuta*, NMV 27634, to show relation of zoecia to one another; $\times 27$.

PLATE 8

- FIG. 1—*Corbulipora (Anaskopora) elevata* (MacGillivray), NMV 27641, showing relation of costae to lateral gymnocyst; $\times 50$.
 FIG. 2—As above, to show details of orifice and distolateral avicularium; $\times 85$.
 FIG. 3—*Corbulipora (Corbulipora) cornuta*, NMV 27634, showing details of frontal wall, orifice and distal avicularium; $\times 45$.
 FIG. 4—*Corbulipora (Anaskopora) elevata*, NMV 27641, showing relation of zoecia and avicularia to one another; $\times 35$.
 FIG. 5—*Corbulipora (Anaskopora) ampulla* Maplestone, NMV P10156, frontal wall of one zoecium; $\times 75$.
 FIG. 6—As above, showing costae and their relation to the frontal wall; $\times 150$.
 FIG. 7—*Corbulipora (Corbulipora) collaris* Canu & Bassler, USNM 189309, showing frontal wall; $\times 95$.
 FIG. 8—As above, USNM 64035, showing frontal wall; $\times 90$.
 FIG. 9—As above, USNM 189309, showing an ovicell; $\times 80$.

PLATE 9

- FIG. 1—*Corbulipora (Corbulipora) oriparma* sp. nov., an unnumbered British Museum (Natural History) specimen, showing the edge of a broken frontal membrane at a level above the base of costae; basal wall of zoecium is in lower right corner; $\times 560$.
- FIG. 2—As above, SUP 14409, showing details of frontal wall and oral shield; $\times 75$.
- FIG. 3—As above, SUP 14403, lateral view of ancestrula; $\times 105$.
- FIG. 4—As above, SUP 14403, view of frontal wall of ancestrula; $\times 120$.
- FIG. 5—As above, SUP 14409, lateral view of zoecium, showing projection of oral shield over frontal wall; $\times 120$.
- FIG. 6—As above, SUP 14412, disto-lateral view of oral shield, first costae of frontal wall is at bottom of photo; $\times 150$.
- FIG. 7—As above, distal view of oral shield; $\times 120$.

PLATE 10

- FIG. 1—*Corbulipora (Corbulipora) oriparma*, SUP 14409, showing details of lateral and basal walls; $\times 45$.
- FIG. 2—As above, showing proximally hinged operculum; $\times 95$.
- FIG. 3—As above, SUP 14405, showing proximal zoecium with oral shield formed whereas frontal development is not complete on distal zoecium and oral shield has commenced formation; $\times 75$.
- FIG. 4—As above, SUP 14406, showing oral outline of a distally placed zoecium; $\times 95$.
- FIG. 5—As above, proximal region of colony showing variation in zoecial shape; $\times 35$.
- FIG. 6—As above, SUP 14409, showing three levels of a distally placed pore chamber; $\times 110$.
- FIG. 7—*Corbulipora (Corbulipora) pennata* Brown, MGSV 53025, lateral view of zoecium; $\times 150$.
- FIG. 8—As above, frontal wall of a zoecium; $\times 90$.
- FIG. 9—*Corbulipora (Corbulipora) oriparma*, SUP 14405, showing relation between development of frontal wall and oral shield in adjacent zoecia and rootlet associated with distal zoecium; $\times 70$.
- FIG. 10—As above, SUP 14409, frontal view of oral shield showing projection of spine to second costae; $\times 170$.
- FIG. 11—As above, distal view of three zoecia with oral shields; $\times 50$.